Snow Coverage Area for the Sierra Nevada –July 1, 2011

The following analysis of **S**now **C**overed **A**rea (SCA) is derived from MODIS (Moderate Resolution Imaging Spectroradiometer) aboard NASA's Terra and Aqua satellites. Data from MODIS are processed to provide a resolution of 500 meters and a fractional SCA product where each pixel can range in value between 0 and 1 (e.g. 0.50=50% of the 500 meter pixel is covered by snow) as opposed to the operational binary product that defines a pixel as either snow or snow free. The MODIS SCA product is available on a daily basis, but viewable areas are subject to cloud cover. In addition, tree canopies mask a portion of the SCA and should be viewed accordingly based on the vegetation characteristics of each hydrologic unit and watershed.

This analysis covers the Sierra Nevada and various river basins, with Figure 1 highlighting the SCA over the Sierra Nevada for June 29, 2011 and June 30, 2010, and Figure 2 showing the monthly change in SCA between June 1 and June 29, 2011. Figures 3 (a-e) focuses on the **Feather**, **American, Tuolumne, Merced, and Kaweah** River basins. The historical April 1 and June 1 SCA represent the average observable SCA across each 300 m (1000 foot) elevation band over the MODIS period 2001-2010*****. Additional basins will be added throughout the year and upon request.

This data and analysis are made available by the University of California, Merced, University of California, Santa Barbara, and NASA's Jet Propulsion Lab under *NASA Grant NNG04GC52 (REASoN CAN 'Multi-resolution snow products for the hydrologic sciences')* and *California Department of Water Resources Agreement 4600008548.*

For further information or comments/suggestions please contact Robert Rice (rrice@ucmerced.edu) or (209)228-4397.

Note, the historical MODIS July 1 average is only 9-years (2002-2010). July 1, 2001 was not available.

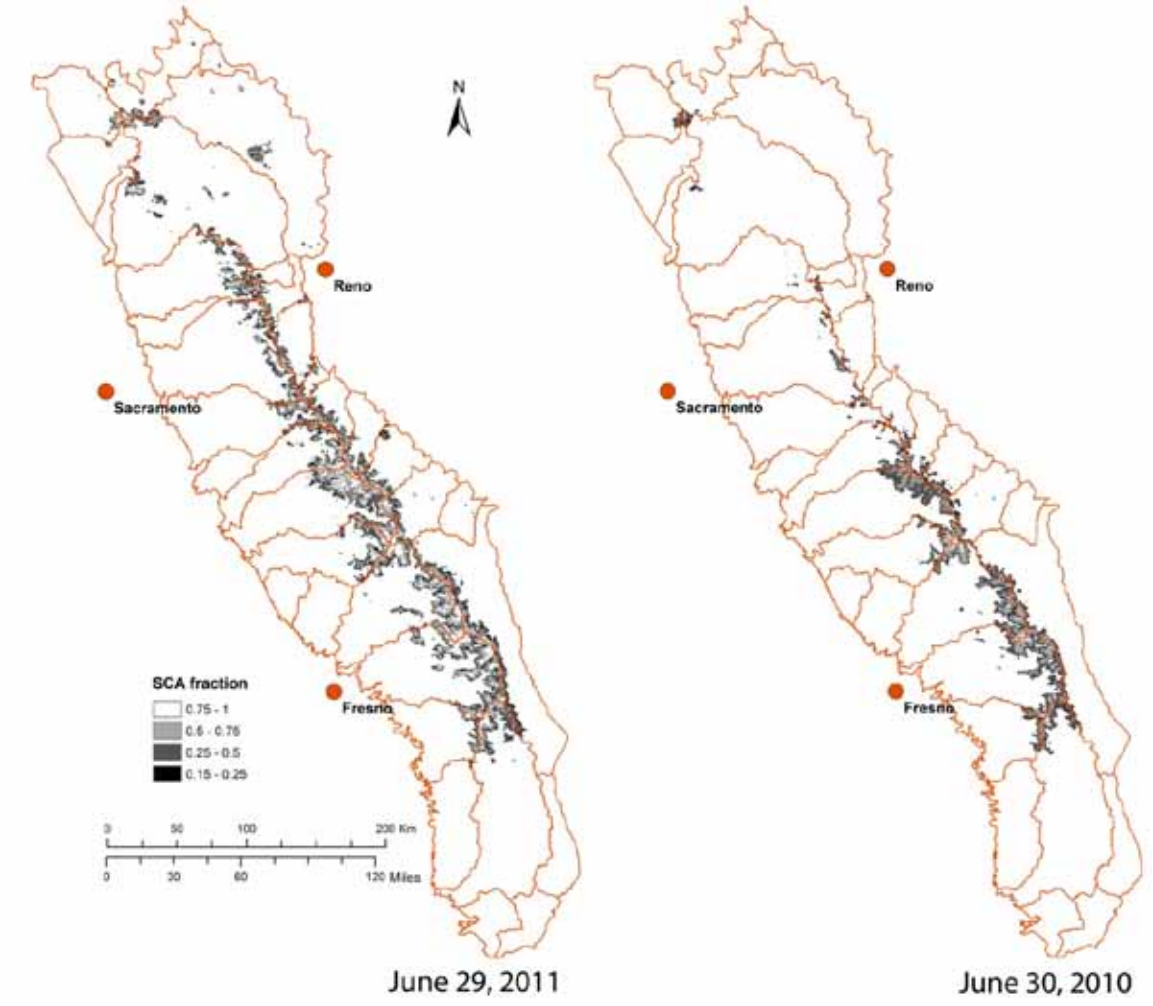


Figure 1. SCA over the **Sierra Nevada** on June 29, 2011 and June 30, 2010 outlined by the individual watersheds. Evident is the greater snow cover extent between June 29, 2011 and June 30, 2010, average. *No snow measurements were performed by the California Cooperative Snow Surveys.*

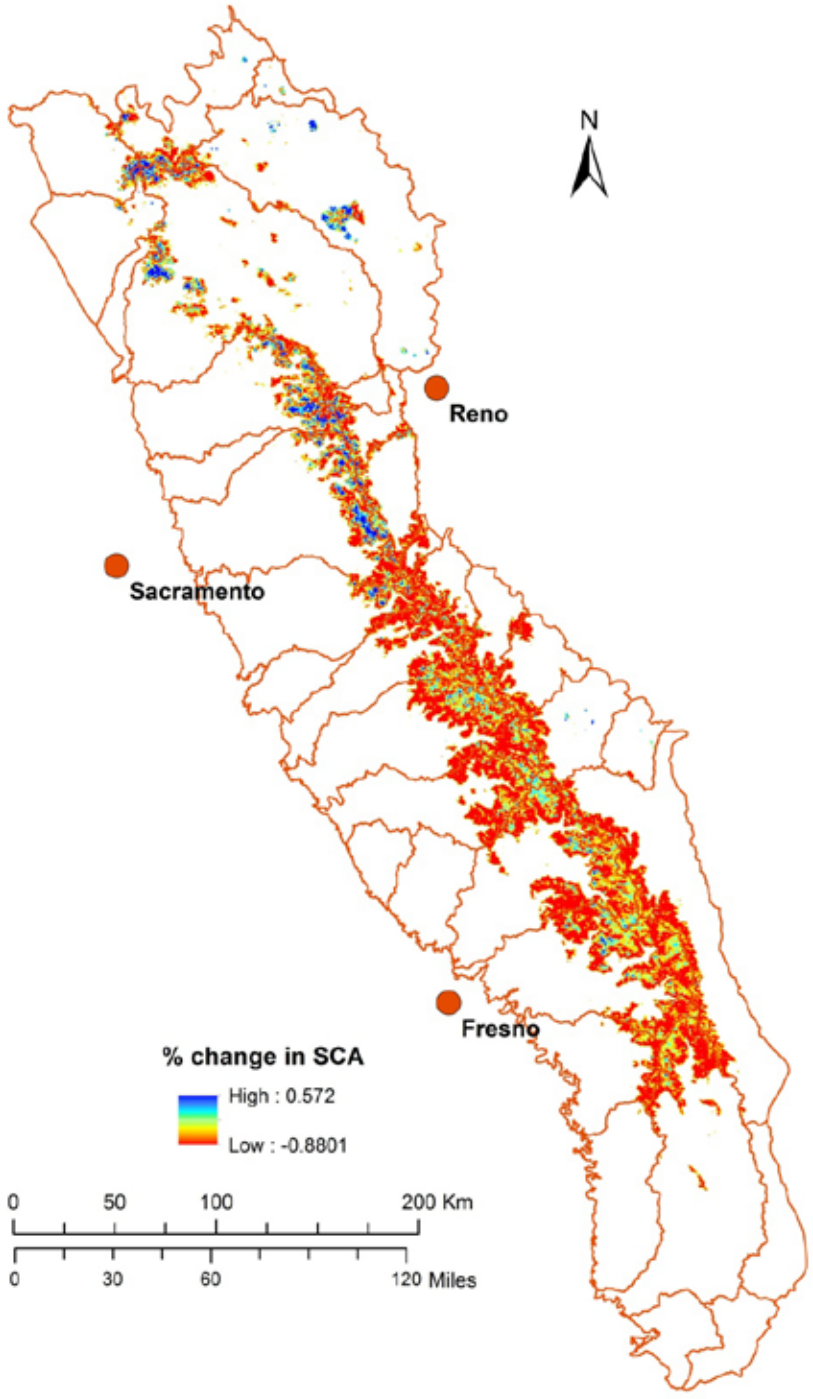
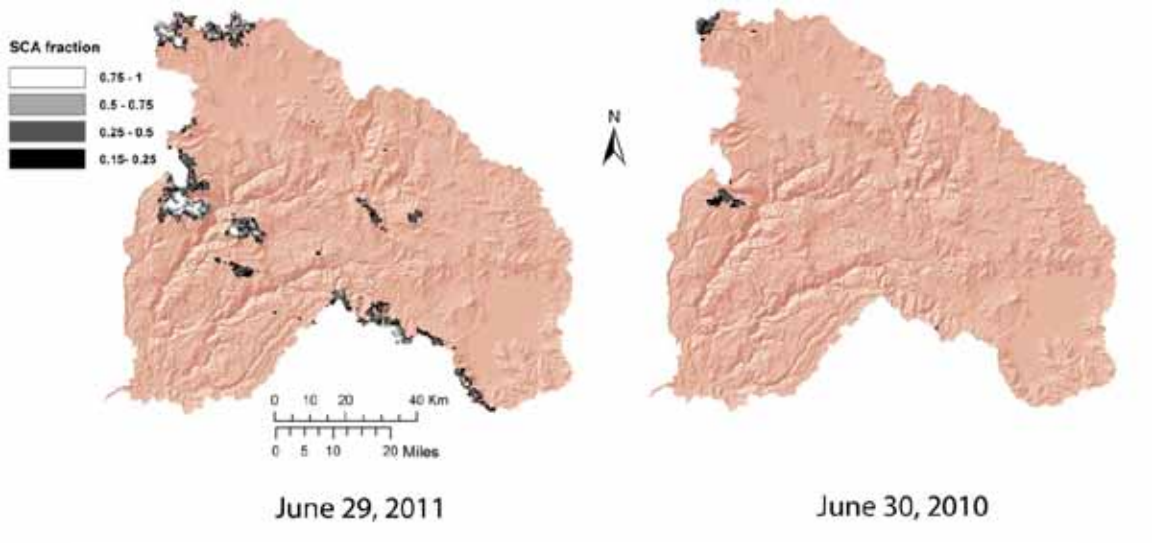
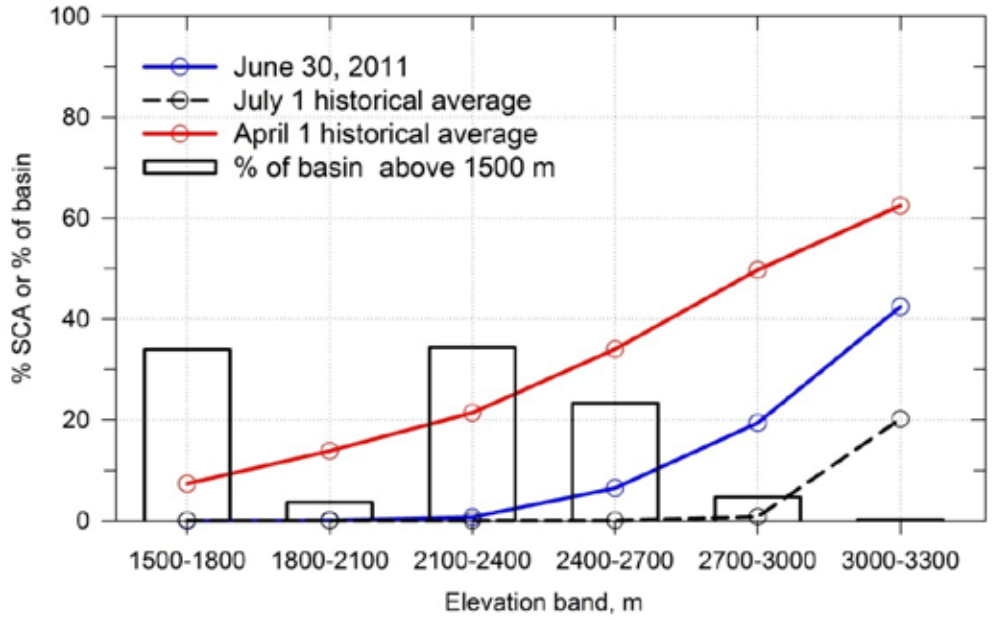


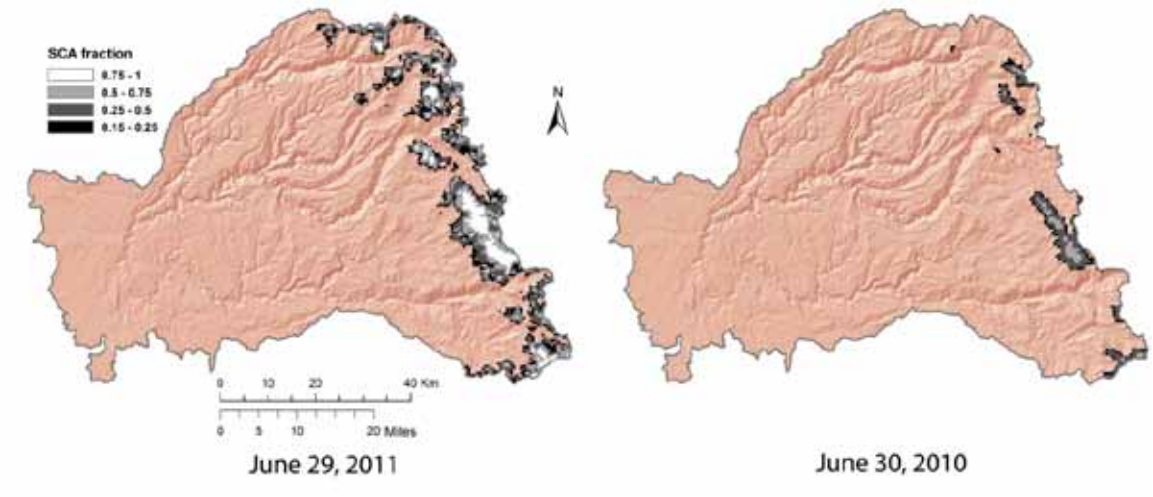
Figure 2. The graph shows the % change of SCA from June 1–June 29, 2011. Of interest is decline SCA across the Sierra Nevada, as warming temperatures contributed to the declining snowpack. However, the snowpack remained relatively stable at the highest elevations.

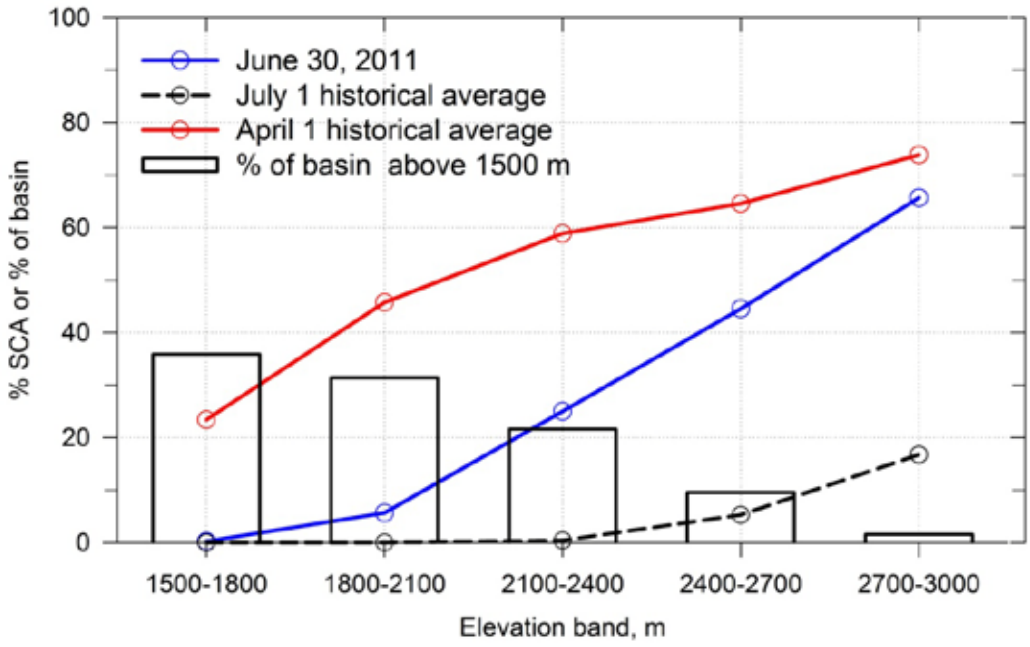




	June 29, 2011	July 1	April 1
1500-1800	0%	0%	7%
1800-2100	0%	0%	14%
2100-2400	1%	0%	21%
2400-2700	6%	0%	34%
2700-3000	19%	1%	50%
3000-3300	42%	20%	62%

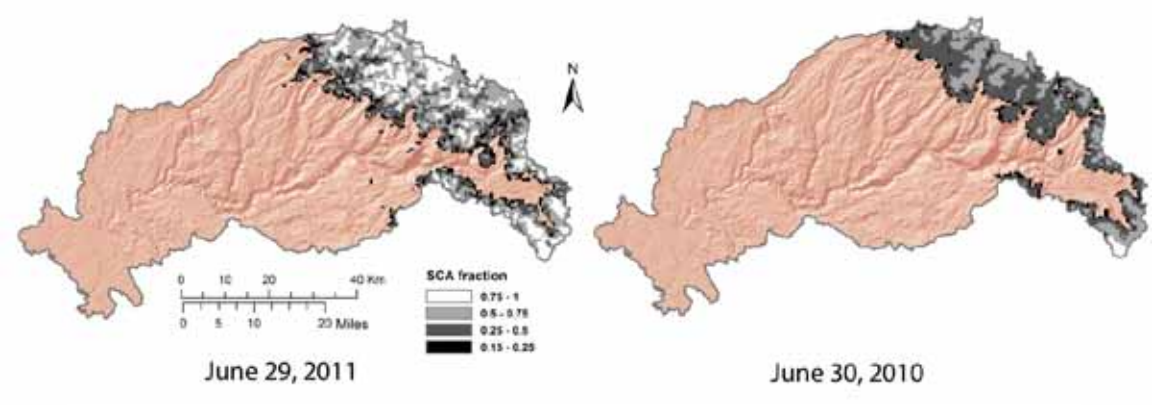
Figure 3(a). SCA over the **Feather River** basin on June 29, 2011 and June 30, 2010. *No data was available from DWR Cooperative Snow Survey for % of average for July1.* Graphical and tabular data represent average % SCA by 300 m (1000 foot) elevation bands over the **Feather River** basin for June 29, 2011 and the April 1 and July 1 historical averages based over the MODIS period 2001-2010*****.

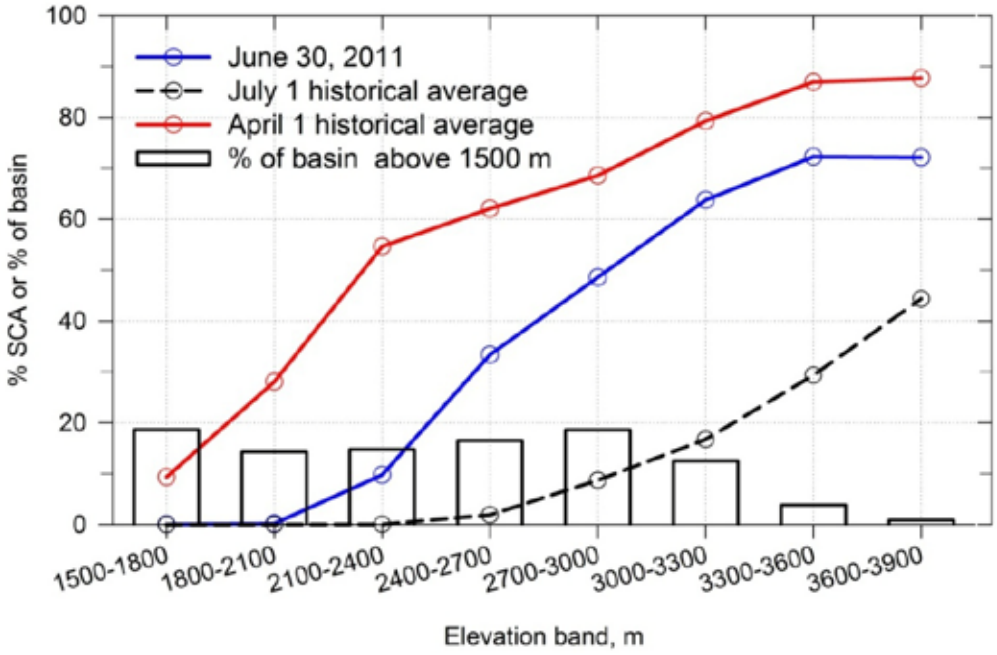




	June 29, 2011	July 1	April 1
1500-1800	0%	0%	23%
1800-2100	0%	0%	46%
2100-2400	6%	0%	59%
2400-2700	45%	5%	65%
2700-3000	66%	17%	74%

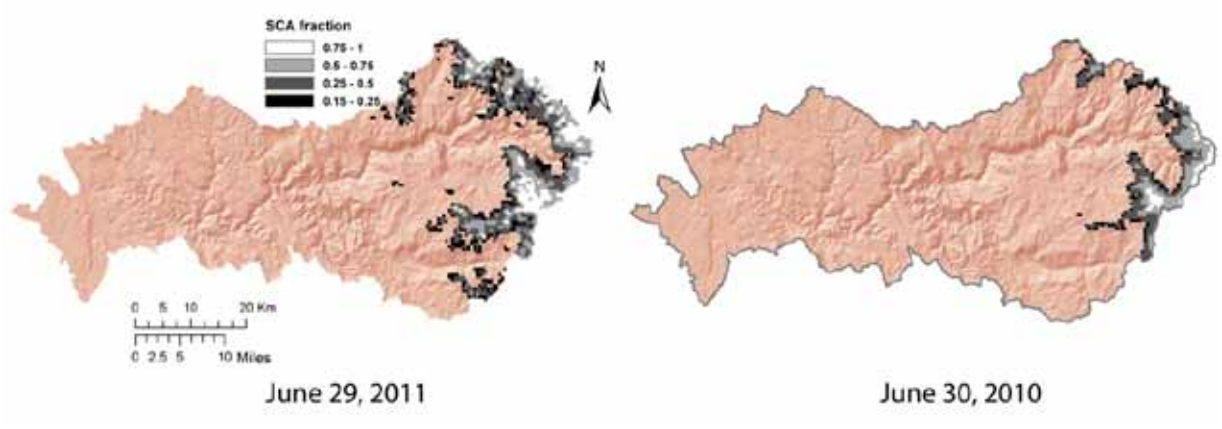
Figure 3(b). SCA over the **American River** basin on June 29, 2011 and June 30, 2010. *No data was available from DWR Cooperative Snow Survey for % of average for July1.* Graphical and tabular data represent average % SCA by 300 m (1000 foot) elevation bands over the **American River** basin for June 29, 2011 and the April 1 and July 1 historical averages based over the MODIS period 2001-2010*****.

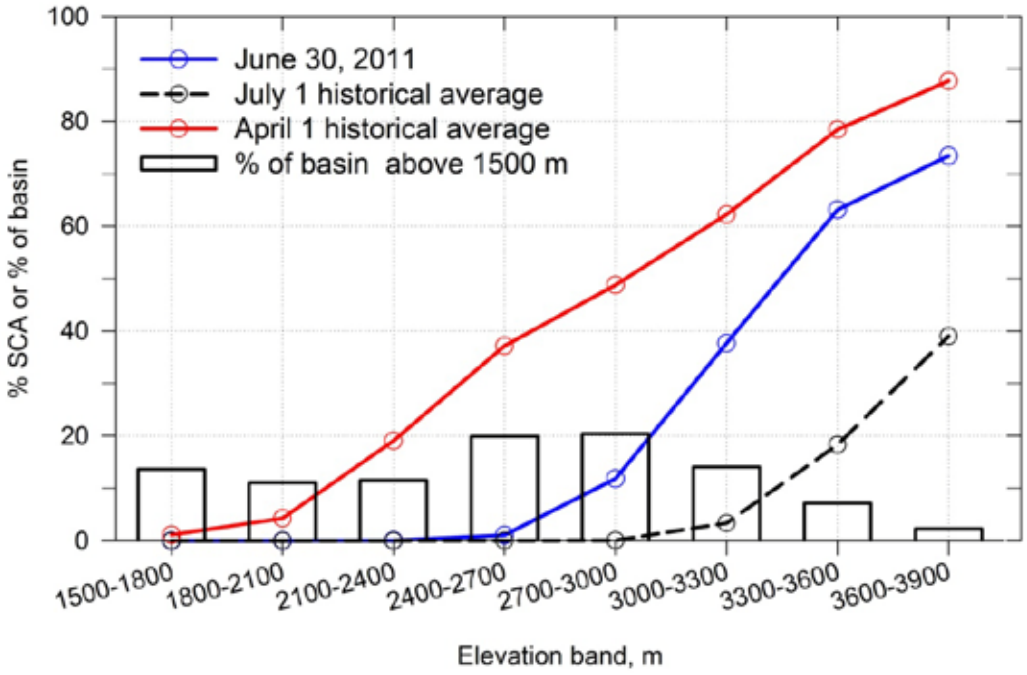




	June 29, 2011	July 1	April 1
1500-1800	0%	0%	9%
1800-2100	0%	0%	28%
2100-2400	10%	0%	55%
2400-2700	33%	2%	62%
2700-3000	49%	9%	69%
3000-3300	64%	17%	79%
3300-3600	72%	29%	87%
3600-3900	72%	44%	88%

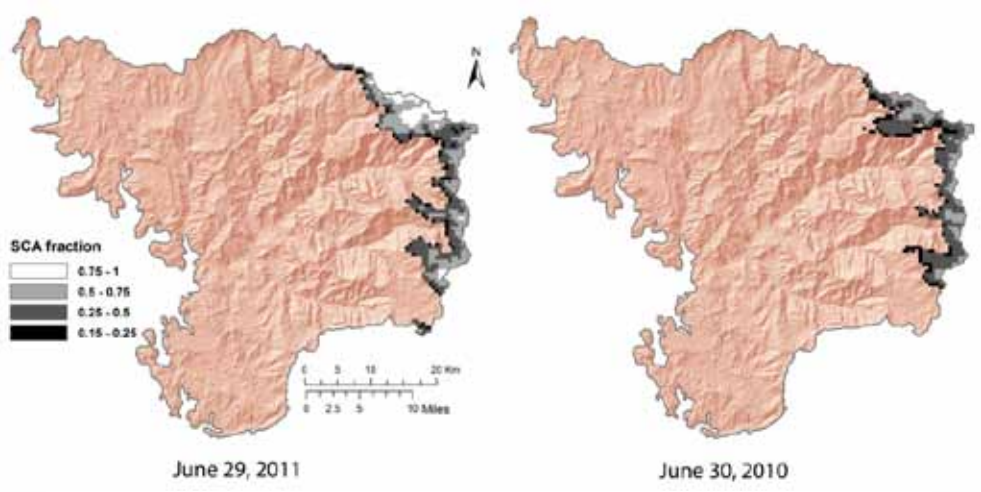
Figure 3(c). SCA over the **Tuolumne River** basin on June 29, 2011 and June 30, 2010. *No data was available from DWR Cooperative Snow Survey for % of average for July1.* Graphical and tabular data represent average % SCA by 300 m (1000 foot) elevation bands over the **Tuolumne River** basin for June 29, 2011 and the April 1 and July 1 historical averages based over the MODIS period 2001-2010*****.

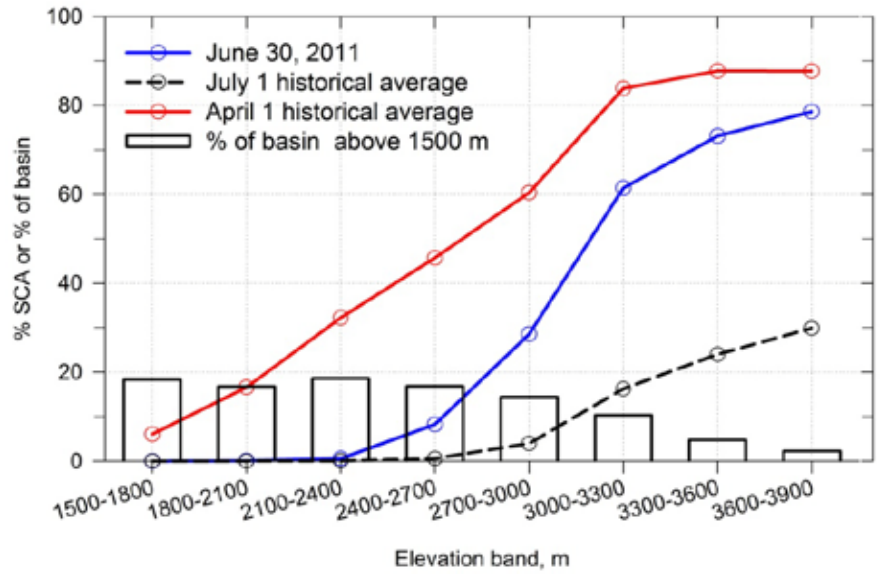




	June 29, 2011	July 1	April 1
1500-1800	0%	0%	1%
1800-2100	0%	0%	4%
2100-2400	0%	0%	19%
2400-2700	1%	0%	37%
2700-3000	12%	0%	49%
3000-3300	38%	3%	62%
3300-3600	63%	18%	78%
3600-3900	73%	39%	88%

Figure 3(d). SCA over the **Merced River** basin on June 29, 2011 and June 30, 2010. *No data was available from DWR Cooperative Snow Survey for % of average for July1.* Graphical and tabular data represent average % SCA by 300 m (1000 foot) elevation bands over the **Merced River** basin for June 29, 2011 and the April 1 and July 1 historical averages based over the MODIS period 2001-2010*****.





	June 29, 2011	July 1	April 1
1500-1800	0%	0%	6%
1800-2100	0%	0%	17%
2100-2400	1%	0%	32%
2400-2700	8%	1%	46%
2700-3000	29%	4%	60%
3000-3300	61%	16%	84%
3300-3600	73%	24%	88%
3600-3900	79%	30%	86%

Figure 3(e). SCA over the **Kaweah River** basin on June 29, 2011 and June 30, 2010. *No data was available from DWR Cooperative Snow Survey for % of average for July1.* Graphical and tabular data represent average % SCA by 300 m (1000 foot) elevation bands over the **Kaweah River** basin for June 29, 2011 and the April 1 and July 1 historical averages based over the MODIS period 2001-2010*****.